Occupational Health Guideline for Ferbam

INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

SUBSTANCE IDENTIFICATION

- Formula: $((CH_3)_2NCS_2)_3Fe$
- Synonyms: Ferric dimethyldithiocarbamate; tris(dimethyldithiocarbamato)iron
- Appearance and odor: Odorless black solid

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for ferbam is 15 milligrams of ferbam per cubic meter of air (mg/m^3) averaged over an eight-hour work shift. The American Conference of Governmental Industrial Hygienists has recommended for ferbam a Threshold Limit Value of 10 mg/m^3.

HEALTH HAZARD INFORMATION

- **Routes of exposure**

Ferbam can affect the body if it is inhaled or if it comes in contact with the eyes or skin. It may also affect the body if it is swallowed.

- **Effects of overexposure**

Ferbam dust may cause irritation of the eyes and respiratory tract. Swallowing large amounts of ferbam or liquids containing ferbam may cause gastrointestinal disturbances. Ferbam may also cause a skin rash in people who are allergic to sulfur.

- **Reporting signs and symptoms:**

A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to ferbam.

- **Recommended medical surveillance**

The following medical procedures should be made available to each employee who is exposed to ferbam at potentially hazardous levels:

1. Initial Medical Screening: Employees should be screened for history of certain medical conditions (listed below) which might place the employee at increased risk from ferbam exposure.

—Chronic respiratory disease: In persons with impaired pulmonary function, especially those with obstructive airway diseases, the breathing of ferbam might cause exacerbation of symptoms due to its irritant properties.

—Skin disease: Ferbam can cause dermatitis. Persons with pre-existing skin disorders may be more susceptible to the effects of this agent.

2. Periodic Medical Examination: Any employee developing the above-listed conditions should be referred for further medical examination.

- **Summary of toxicology**

Ferbam dust irritates the eyes and respiratory tract. In guinea pigs given ferbam by stomach tube, the lethal range was 450 to 2000 mg/kg; the animals became stuporous and died in coma. Ten of 20 rats died from a diet containing 0.5% ferbam for 30 days; there was a slight and ill-defined tendency toward anemia; at autopsy there was no evidence of a regularly appearing tissue injury; minor abnormalities of the lung, liver, kidney and bone marrow were observed in a few animals. In humans, the dust is irritating to the eyes and respiratory tract; it causes dermatitis in individuals sensitized to sulfur. Large oral doses cause gastrointestinal disturbances. Because of chemical similarity to Antabuse, absorption of ferbam may potentiate action of ethyl alcohol.

CHEMICAL AND PHYSICAL PROPERTIES

- **Physical data**
  1. Molecular weight: 416.5
  2. Boiling point (760 mm Hg): Decomposes

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3. Specific gravity (water = 1): Greater than 1
4. Vapor density (air = 1 at boiling point of ferbam): Not applicable
5. Melting point: 180 C (356 F) (decomposes)
6. Vapor pressure at 20 C (68 F): Essentially zero
7. Solubility in water, g/100 g water at 20 C (68 F): 0.012
8. Evaporation rate (butyl acetate = 1): Not applicable

• **Reactivity**

1. Conditions contributing to instability: Temperatures above 180 C (356 F) cause decomposition with formation of toxic gases.
2. Incompatibilities: Contact with strong oxidizers may cause fires and explosions.
3. Hazardous decomposition products: Toxic gases and vapors (such as oxides of sulfur and nitrogen and carbon monoxide) may be released in a fire involving ferbam.
4. Special precautions: None.

• **Flammability**

1. Flash point: Not applicable
2. Minimum ignition temperatures: 280 C (536 F) (cloud); 150 C (302 F) (layer)
3. Minimum explosive dust concentration: 0.055 g/l
4. Extinguishant: Water, dry powder

• **Warning properties**

Grant states that ferbam "is a fungicide, the dust of which is irritating to the eye, nose, throat, and skin."

MONITORING AND MEASUREMENT PROCEDURES

• **General**

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

• **Method**

At the time of publication of this guideline, no measurement method for ferbam had been published by NIOSH.

RESPIRATORS

• Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.

• In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

PERSONAL PROTECTIVE EQUIPMENT

• Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent repeated or prolonged skin contact with ferbam or liquids containing ferbam.

• If employees' clothing may have become contaminated with ferbam or liquids containing ferbam, employees should change into uncontaminated clothing before leaving the work premises.

• Clothing contaminated with ferbam should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of ferbam from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the ferbam, the person performing the operation should be informed of ferbam's hazardous properties.

• Non-impervious clothing which becomes contaminated with ferbam should be removed promptly and not reworn until the ferbam is removed from the clothing.

• Employees should be provided with and required to use splash-proof safety goggles where ferbam or liquids containing ferbam may contact the eyes.

SANITATION

• Skin that becomes contaminated with ferbam should be promptly washed or showered with soap or mild detergent and water to remove any ferbam.

• Eating and smoking should not be permitted in areas where solid ferbam is handled, processed, or stored.

• Employees who handle ferbam or liquids containing ferbam should wash their hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to ferbam may occur and control methods which may be effective in each case:

Operation	Controls
Formulation of fungicides	Process enclosure; local exhaust ventilation; personal protective equipment
Application as a foliage fungicide for control of scab and rust diseases	Personal protective equipment
Manufacture of ferbam	Process enclosure; local exhaust ventilation; personal protective equipment

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

• **Eye Exposure**

If ferbam or liquids containing ferbam get into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. If irritation is present after washing, get medical attention immediately. Contact lenses should not be worn when working with this chemical.

• **Skin Exposure**

If ferbam or liquids containing ferbam get on the skin, promptly wash the contaminated skin using soap or mild detergent and water. If ferbam or liquids containing ferbam penetrate through the clothing, remove the clothing promptly and wash the skin using soap or mild detergent and water. If irritation is present after washing, get medical attention.

• **Breathing**

If a person breathes in large amounts of ferbam, move the exposed person to fresh air at once.

• **Swallowing**

When ferbam or liquids containing ferbam have been swallowed and the person is conscious, give the person large quantities of water immediately. After the water has been swallowed, try to get the person to vomit by having him touch the back of his throat with his finger. Do not make an unconscious person vomit. Get medical attention immediately.

• **Rescue**

Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

SPILL AND DISPOSAL PROCEDURES

• Persons not wearing protective equipment and clothing should be restricted from areas of leaks until cleanup has been completed.

• If ferbam is spilled, the following steps should be taken:

1. Ventilate area of spill.
2. Collect spilled material in the most convenient and safe manner and deposit in sealed containers for reclamation, or for disposal in a secured sanitary landfill. Liquid containing ferbam should be absorbed in vermiculite, dry sand, earth, or a similar material.

• Waste disposal method:

Ferbam may be disposed of in a secured sanitary landfill.

ADDITIONAL INFORMATION

To find additional information on ferbam, look up ferbam in the following documents:

• Medical Surveillance for Chemical Hazards
• Respiratory Protection for Chemical Hazards
• Personal Protection and Sanitation for Chemical Hazards

These documents are available through the NIOSH Division of Technical Services, 4676 Columbia Parkway, Cincinnati, Ohio 45226.

REFERENCES

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RESPIRATORY PROTECTION FOR FERBAM

Condition	Minimum Respiratory Protection* Required Above 15 mg/m³
Particulate Concentration	
75 mg/m³ or less**	Any dust respirator, except single-use.
150 mg/m³ or less**	Any dust respirator, except single-use or quarter-mask respirator. Any fume respirator or high efficiency particulate filter respirator. Any supplied-air respirator. Any self-contained breathing apparatus.
750 mg/m³ or less	A high efficiency particulate filter respirator with a full facepiece. Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
7500 mg/m³ or less	A powered air-purifying respirator with a high efficiency particulate filter. A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode.
Greater than 7500 mg/m³ or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	Any dust respirator, except single-use. Any escape self-contained breathing apparatus.

*Only NIOSH-approved or MSHA-approved equipment should be used.

**If eye irritation occurs, full-facepiece respiratory protective equipment should be used.